

Introductions of the Scorpions *Centruroides vittatus* (Say) and *C. hentzi* (Banks) into North Carolina, with Records of the Indigenous Scorpion, *Vaejovis carolinianus* (Beauvois) (Scorpionida: Buthidae, Vaejovidae)

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ABSTRACT—The scorpions *Centruroides vittatus* (Say) and *C. hentzi* (Banks), with subaculear tubercles on their telsons, have been accidentally imported into piedmont and coastal North Carolina and may become established in parts of these regions. They are distinguished by the larger size of *C. vittatus* and by the following differences in pigmentation: the presence of a darkly pigmented, inverted triangular patch on the cephalothorax of *C. vittatus*, as opposed to light mottled brownish coloration in *C. hentzi*, and by the reticulated brown pigmentation on the dorsal surfaces of the chelicerae of *C. hentzi*, in contrast to the unpigmented condition in *C. vittatus*. The native scorpion, *Vaejovis carolinianus* (Beauvois), which lacks the subaculear tubercle, occurs in southwestern border counties adjoining South Carolina and Georgia and has penetrated the western fringe of the State, occurring just inside the Tennessee state line in the French Broad and Little Tennessee river valleys. It is also recorded from Yancey, Haywood, Mecklenburg, Iredell, Guilford, Wake, and Columbus counties, all probably representing accidental human importations. A key, descriptive drawings, and a map of occurrences are presented.

In April 1991, I was notified that employees in a north Raleigh office building had encountered and trapped a scorpion in a hallway. *Vaejovis*¹ *carolinianus* (Beauvois) (family Vaejovidae), occurring in southwestern border counties adjoining South Carolina and Georgia, some 208 mi (333 km) from Raleigh (Shelley 1975a, b), is the only scorpion native to North Carolina, so I was surprised to find that they had a specimen of *Centruroides vittatus* (Say) (family Buthidae), a species occurring in the southcentral and southwestern United States and the adjacent states in northern Mexico (Stahnke and Calos 1977). This individual had been unknowingly transported to North Carolina in a shipment of mesquite lumber for an adjoining

¹ Francke (1977) showed that *Vaejovis* and Vaejovidae, with an "a", are the correct spellings for the genus and family, respectively, as opposed to the previous orthography without this vowel.

steak restaurant and had wandered into the office building. Occupants reported seeing occasional scorpions for a year previously, but thorough searches of the building, its grounds, and a nearby rocky ditch in both daytime and at night, using a black light, produced no more specimens. Shortly afterwards I learned that individuals of *C. vittatus* had been encountered near downtown Raleigh and in a building in the Research Triangle Park, in both cases near restaurants using mesquite to broil steaks. The species has also been collected in Nash and Dare counties, and a Florida scorpion, *C. hentzi* (Banks), has been discovered in Carteret and Brunswick counties, on the North Carolina coast, and in Durham County in the Piedmont. Thus, three scorpions (dorsal views in Fig. 1) may now be encountered in North Carolina.

The origins of most accidental animal introductions cannot be traced, but if reproducing populations of either *C. vittatus* or *C. hentzi* become established in North Carolina through the introduction of a gravid female or a mating pair, I believe they will have resulted from

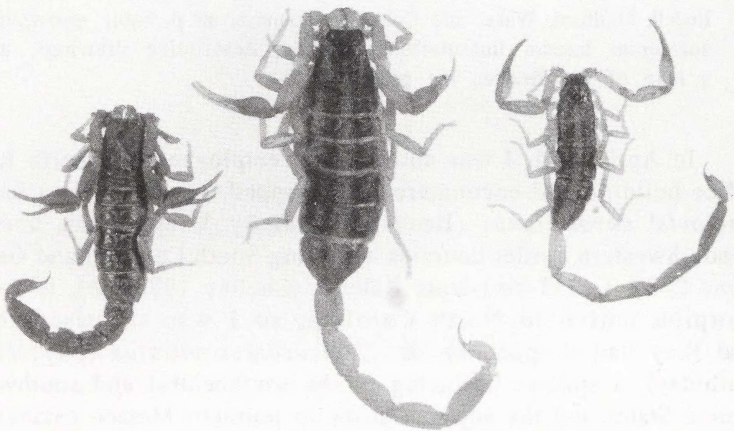


Fig. 1. Dorsal views of, left to right, *V. carolinianus*, *C. vittatus*, and *C. hentzi*.

human introductions that occurred primarily in the late 1980's and the early 1990's. Both species can potentially survive and reproduce in parts of North Carolina, thereby becoming components of the State's fauna. Likewise, *V. carolinianus* can potentially survive and reproduce north and east of Polk, and the adjacent fringe of Rutherford, counties. If such populations are ever discovered, they too will date from the late 1980s and early 1990s.

These scorpions are not dangerous to man, their stings being roughly comparable to those of bees and wasps. Muma (1967) reported that the sting of *C. hentzi* produced a localized burning sensation and that the area was tender for a few hours; the venom of *C. vittatus* produces a similar, though more painful, reaction. No information is available on the venom of *V. carolinianus*, but no species of this genus is known to be harmful (Muma 1967).

For the benefit of local naturalists, I announce the discovery of these non-native arachnids in North Carolina, publish the available records along with an identification key and pertinent illustrations, and update the known localities of *V. carolinianus*. Acronyms of sources of preserved study material are as follows:

AMNH - American Museum of Natural History, New York,
New York.

DEH - Division of Environmental Health, Public Health Pest
Management Section, North Carolina Department of
Environment, Health, and Natural Resources, Raleigh.

FMNH - Field Museum of Natural History, Chicago, Illinois.

FSCA - Florida State Collection of Arthropods, Gainesville.

MEM - Mississippi Entomological Museum, Mississippi State
University, Starkville.

MMNS - Mississippi Museum of Natural Science, Jackson.

NCDA - Division of Plant Industry, North Carolina Department
of Agriculture, Raleigh.

NCSM - North Carolina State Museum of Natural Sciences, Raleigh.

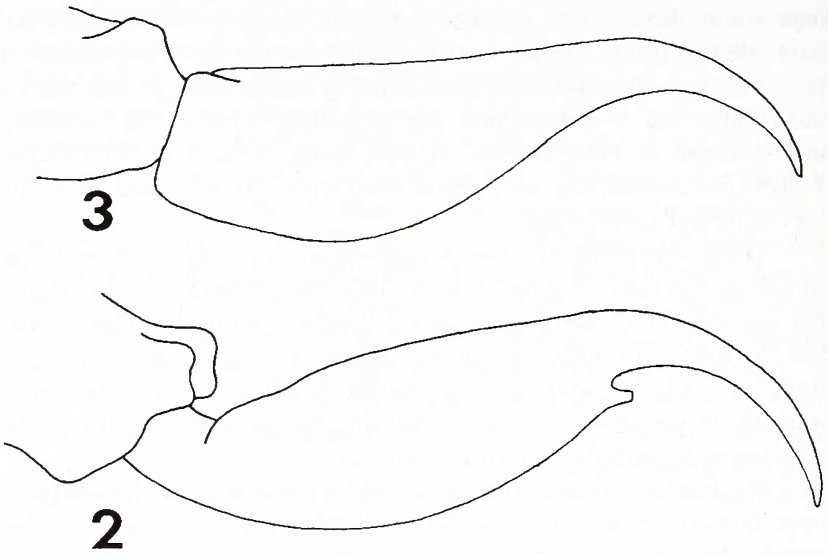
NCSU - Entomology Department, North Carolina State University,
Raleigh.

NMNH - National Museum of Natural History, Smithsonian
Institution, Washington, DC.

NSC - Natural Science Center, Greensboro, North Carolina.

RNH - Private collection of R. N. Henson, Boone, North Carolina.

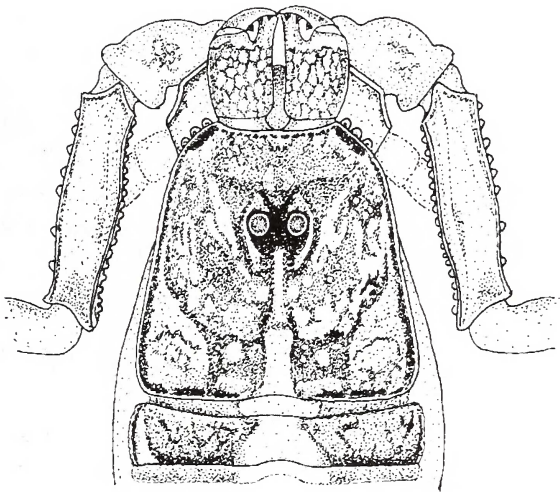
SEM - Snow Entomological Museum, University of Kansas, Lawrence.



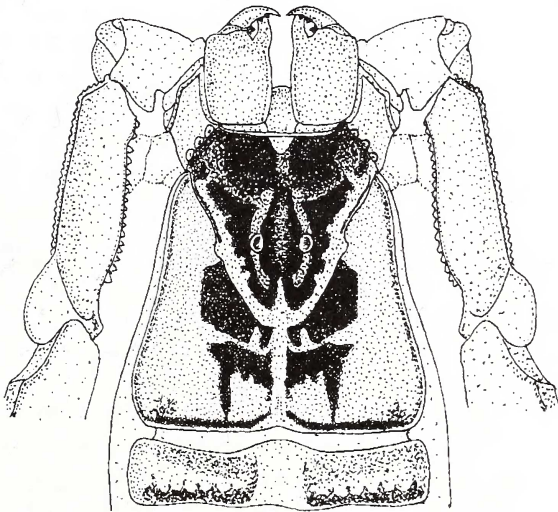
Figs. 2-3. Comparison of telsons, setation omitted. 2, *C. vittatus*; 3, *V. carolinianus*.

Key to the Scorpions in North Carolina

- 1. Telson with variable subaculear tubercle (Fig. 2); pigmentation yellow to yellow brown with obvious, dorsal, longitudinal stripes..... 2
 Telson without subaculear tubercle (Fig. 3); pigmentation generally dusky brown, without stripes; southeastern states from Kentucky and southwestern North Carolina to southeastern Louisiana
 *Vaejovis carolinianus* (Beauvois)
- 2. Cephalothorax light, mottled brown, without black, interocular triangle, chelicerae with reticulated brown pigmentation (Fig. 4); small species, adults ca. 32-44 mm in length including metasoma and telson; Florida
 *Centruroides hentzi* (Banks)
 Cephalothorax darkly pigmented, with well defined, black triangle pointing caudad and extending just beyond ocular tubercle, chelicerae unpigmented (Fig. 5); large species, adults ca. 40-60 mm in length; southcentral to southwestern United States and northern Mexico
 *Centruroides vittatus* (Say)



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Figs. 4-5. Color patterns of the chelicerae and cephalothorax. 4, *C. hentzi*; 5, *C. vittatus*.

Family Buthidae

Centruroides vittatus (Say)

Habitat—In its native range, *C. vittatus* occurs in a wide variety of microhabitats in deserts, deciduous and pine forests, and grasslands. It lives in cracks and crevices of rocky outcrops and canyons walls, climbs into vegetation, occurs beneath yuccas in deserts and grasslands, and commonly enters houses (W. D. Sissom, West Texas A&M University, personal communication). The specimens from Nash and Dare counties, the Research Triangle Park, and Bland Road, Raleigh, were discovered inside buildings; those at the last two sites were walking across a room and a hallway. The specimen from Wakefield Street, Raleigh, was found by workers digging behind a building.

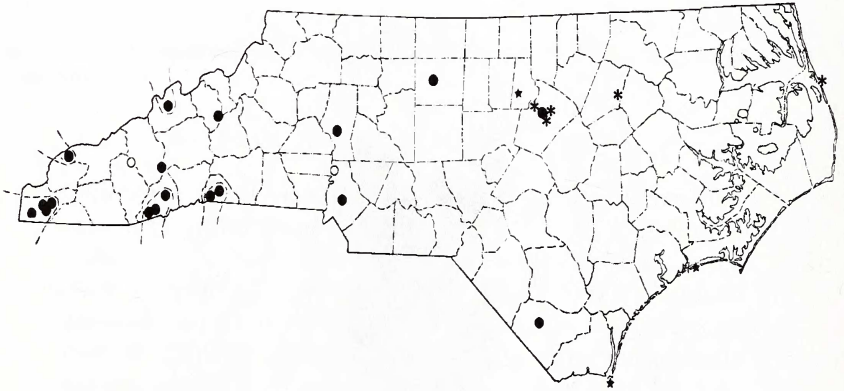


Fig. 6. Occurrences of scorpions in North Carolina. Dots, *V. carolinianus*; stars, *C. hentzi*; asterisks, *C. vittatus*. The site record from near Cowans Ford Dam, Mecklenburg County, is indicated by the eastern circle; that from Transylvania County is obscured by a dot. The western circle, in Jackson County, denotes Balsam Gap, the location from which the wood containing *V. carolinianus* in Haywood County was obtained. Dashed lines surround presumably indigenous records in western counties showing the assumed expansions from adjoining states.

Distribution—The generalized range of the southcentral and southwestern United States to northern Mexico can be stated more specifically as from Louisiana to New Mexico east of the Rio Grande and, latitudinally, from the Central Plains of the United States into the adjoining northern states of Mexico (W. D. Sissom, personal communication). North Carolina specimens were examined as follows (Fig. 6):

Wake Co., Raleigh, office building along Bland Rd., 1 spmn., April 1991, J. Wigmore (NCSM) and along Wakefield St., 1 spmn., 24 October 1986, M. A. Brittain (NCSU); and Research Triangle Park, 1 spmn., August 1991, collector unknown (NCSM). Nash Co., Rocky Mount, 1 spmn., 26 July 1991, collector unknown (NCSM). Dare Co., Nags Head, in building behind self storage facility, 1 spmn., 10 May 1986, L. Griffin (NCSU).

Remarks—Because winters in North Carolina's piedmont are considerably milder than those in its native range in the midwest, *C. vittatus* potentially could become established in the central part of the State. An introduced population now exists in Murfreesboro, Rutherford County, Tennessee (W. D. Sissom and G. A. Polis, Vanderbilt University, personal communication).

There is at least one widespread chain of restaurants that broil steaks over mesquite, so introduced, reproducing populations of *C. vittatus* may exist in major cities throughout the Southeast. Use of mesquite chips for broiling, rather than whole logs or lumber, would produce the same flavor and eliminate the possibility of importing live scorpions, not to mention unknown numbers of insects that might have an adverse economic impact on agriculture.

Centruroides hentzi (Banks)

Habitat—In Florida, *C. hentzi* is usually encountered under litter, logs, and stones; it can also be found under bark of dead trees up to 20 ft (6 m) high and commonly invades houses (Muma 1967). The Durham County specimen was discovered in a rolled towel in a dormitory; those from Carteret and Brunswick counties were found in residences in condominium buildings, the 1992 scorpion was encountered in a bathtub. At Emerald Isle, four specimens were found in hallways and closets on both floors in a beachfront Carteret County condominium complex during a two-month period in summer 1993, and two more were encountered in May 1994. Six condominium units were involved, comprising the northern half of one building; scorpions were not discovered in the other buildings of the complex. One scorpion was found dead in a man's shoe, and another stung a young child, who was

treated at Carteret General Hospital and released. A pest control operator treated inside and outside the building with pesticide but could not determine the source of the scorpions. I visited the site in October 1994 and found no specimens and little shelter near the building. The yard of the complex was immaculate, and the building is bordered by low bushes surrounded with pine straw. Some bushes had grown into relatively dense hedges, and the only external shelter of consequence was beneath these hedges. I spent two hours searching around the building, elsewhere on the complex, and in nearby wooded areas in Emerald Isle and the western tip of Bogue Banks without finding any scorpions.

Distribution—According to Muma (1967), *C. hentzi* occurs throughout Florida, occurring in Columbia County, on the border with Georgia, and in Escambia, the westernmost county. It should therefore be expected in the southern coastal islands of Georgia, where Say (1821) collected scorpions. North Carolina specimens were examined as follows (Fig. 6):

Durham Co., Durham, Duke Univ., 1 spmn., 8 September 1987, C. Brock (NCSU). *Carteret Co.*, Bogue Banks, Emerald Isle, 1 spmn., Sept. 1993, D. McCluskey (NCSM). *Brunswick Co.*, Bald Head Island, 1 mi (1.6 km) E of Marina, 1 spmn., July 1992, collector unknown (RNH) and unknown site on island, 1 spmn., February 1993, collector unknown (NCSM).

Remarks—An individual of *C. hentzi* was encountered in Raleigh on 10 March 1938 “in strawberries from Florida”; one of *C. gracilis* (Latreille) was discovered in Raleigh in the fall 1940 “in box shipped from Florida”; and an undetermined Neotropical scorpion was found in Raleigh on 13 December 1937 “in bunch of bananas from Central & South America” (all specimens in NCDA). Although not encountered in North Carolina environments, these specimens confirm that commercial activities, like importing foods and fruits from other states and foreign countries, is a key mechanism through which allochthonous organisms are accidentally introduced into distant areas. The importation of Florida palm trees for planting along the North Carolina coast can only aid the spreading of *C. hentzi* and may result in its becoming established in warm areas like Bald Head Island, where winters are not much cooler than those in northern Florida where the scorpion is common.

Family Vaejovidae

Vaejovis carolinianus (Beauvois)

Habitat—I collected *V. carolinianus* in Cherokee County from beneath large rocks on a dirt road and leaves in a deciduous forest

(Shelley 1975a), but I typically encounter the scorpion in association with decaying pine logs and stumps, particularly under loose bark. Rossman (1979) encountered specimens in clay soil on a stream bank, and beneath decaying logs, leaf litter, slabs of wood, and the bark of a dead hardwood tree. Gibbons et al. (1990) stated that *V. carolinianus* was restricted to moist woodland habitats, where it occurs beneath leaves, logs, and other litter. Several specimens from Transylvania and Polk counties were found in and around houses; that from Guilford County was taken within a house; and the one from Iredell County was discovered in a sink in the basement of a house, but it could have been imported from north Georgia, where the collector spent the previous week. The specimen from Yancey County was discovered in a tent at a campground.

Distribution—The southeastern United States from the Ohio River in central Kentucky through eastern Tennessee, southwestern North Carolina, and the Fall Zone of South Carolina and Georgia, to eastern Mississippi and westcentral Tennessee, with a disjunct population in the Tunica Hills of southwestern Mississippi and southeastern Louisiana (Rossman 1979, Gibbons et al. 1990, Shelley 1994). In North Carolina, *V. carolinianus* is native to Polk, Transylvania, and Cherokee counties, spreading into these areas and up the Toxaway and Hiwassee river valleys from adjacent parts of northern Georgia and western South Carolina. It also penetrates the western periphery by extending up the Little Tennessee and French Broad river valleys from eastern Tennessee. The scorpion also has been encountered in seven other counties, five in the interior of the State and two on the border with piedmont and coastal South Carolina, which probably represent accidental human importations and examples of intra-state introductions. The Haywood County site, in the heart of the Blue Ridge Province and at 5,000 ft. (1,500 m) elevation, the highest reported altitude for the scorpion, surely reflects an importation, as *V. carolinianus* was found in a woodpile that was brought from Balsam Gap, Jackson County. The scorpion was probably transported from the latter site (open circle in Fig. 6); Haywood County is also in the heart of the Blue Ridge and an unlikely spot for a native population. North Carolina specimens were examined as follows:

Yancey Co., Crabtree Meadows, along Blue Ridge Pkwy., 1 spmn., 8 June 1960, L. Mason (SEM). *Madison Co.*, 1 mi (1.6 km) SE Walnut, along US hwy. 25/70, 1 spmn., 25 August 1981, B. Hill (NCSM). *Haywood Co.*, Mt. Pisgah Cpgd., 1 spmn., August 1993, B. Randolph (RNH). *Swain Co.*, 0.5 mi (0.8 km) N Tapoco, along Little Tenn. R., 2 spmns., 13 August 1985, R. Gaul, J. Whitcomb, D. Anthony, R. Lee

(NCSM). *Cherokee Co.*, locality unknown, 2 spmns., J. Gallatin (NMNH) and 1 spmn., 19 June 1988, collector unknown (DEH); 6 mi (9.6 km) WNW Culberson, along co. rd. 1107, 0.2 mi (0.3 km) N jct. co. rd. 1108, 1 spmn., 27 June 1974, R. M. Shelley (NCSM); 5 mi (8 km) W Murphy, along US hwy. 64, 1 spmn., 1 October 1987, F. Bailey (RNH); 7.2 mi (11.5 km) NW Murphy, along co. rd. 1326, 0.3 mi (0.5 km) W jct. co. rd. 1406, 2 spmns., 27 June 1974, R. M. Shelley (NCSM); and 1.7 mi (2.7 km) N Murphy, 1 spmn., 22 June 1984, A. L. & A. B. Braswell (NCSM). *Transylvania Co.*, 4.5 mi (7.2 km) SW Rosman, along co. rd. 1139, 1 spmn., 3 December 1980, A. Burdo (NCSM); Brevard, 1 spmn., 5 September 1975, D. Sizemore (NCSM) and in house, 1 spmn., 18 November 1985, M. Albertson (NCSU); and along Bearcamp Cr., 0.5 mi (0.8 km) N SC border, 1 spmn., 25 June 1962, R. C. Graves (NCSM). *Polk Co.*, nr. Tryon, 1 spmn., 16 September 1934, collector unknown (NMNH); Tryon, around houses under construction, 2 spmns., 10 April 1957, D. F. Ashton (NCSM) and in leaf litter, 1 spmn., 21 November 1949, L. Eisenach (FMNH); in house 1.5 mi (2.4 km) WNW Columbus, along co. rd. 1135, 4 spmns., 21 September 1984, O. R. Ammons (NCSU); and Columbus, 3 spmns. 22 April 1957, G. D. Jones (NCSM, NMNH) and 1 spmn., 1973, P. Culberson (NCSM). *Mecklenburg Co.*, Charlotte, Farmingdale Dr., 1 spmn., 8 August 1970, M. Overton (NCSM). *Iredell Co.*, 5 mi (8 km) SSW Troutman, SR 1401 at Lake Norman, 1 spmn., 25 June 1990, K. Troutman (NCSU). *Guilford Co.*, Greensboro, 1 spmn., November 1992, collector unknown (NSC). *Wake Co.*, Raleigh, Fairway Ridge Dr., 1 spmn., 25 August 1990, F. Starnes (NCSM). *Columbus Co.*, Whiteville, 1 spmn., 9 July 1976, J. Rogers (NCSM).

The following site records are also considered valid but not substantiated by specimens:

Transylvania Co., Toxaway Gorge, under bark of logs in 1963 (J. R. Paul).

Mecklenburg Co., Cowans Ford Dam at Lake Norman, under mat in a building ca. 1987 (K. L. Manuel).

There are also two specimens taken in the "western part of state," exact location unknown, 5 October 1965, J. Gallion (AMNH).

Remarks—Because of the abundance of predominantly pine forests like those in which it occurs in piedmont South Carolina and Georgia, *V. carolinianus* could become established in central North Carolina through accidental importations from its natural range in this or other states.

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